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Eco-Friendly Management of *Allopeas clavulinum (*spike awl snail) Through the Application of Herbal Pesticide

Akanksha Tripathi

Zoology Department, M.L.K. P.G. College, Balrampur, U.P., India

Author's Mail Id: akt.zoology@gmail.com, Mob- 8052047111

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Abstract-The *Allopeas clavulinum (*spike awl snail) is a mud loving garden and nursery inhabiting mollusc which is very harmful for seedlings of plants as well as a vector for some parasitic helminths.
Keeping in the mind the hazardous effect of synthetic chemical pesticides, some plants were screened for their eco-friendly pesticidal effect. The Leaf extract of *Prosopis cineraria* was found very effective for the eco-friendly management of these harmful snails.

Keywords- Herbal Pesticide, *Allopeas clavulinum*, *Prosopis cineraria*, Biocontrol

I. INTRODUCTION

Allopeas clavulinum syn. Lamellaxis clavulinus commonly called as spike awl snail [1] generally lives in garden soils, leaf litters and wetlands. These tiny molluscs generally heavily feed on seedling and saplings in garden nursery and agricultural fields and cause commercial damage. *Allopeas clavulinum* is also a vector for parasitic helminthes such as the rat lung worm *Angiostrongylus cantonensis*, causal organism of CNS damaging disease 'eosinophilic meningitis' [2].

Today's farmers and gardeners want to avoid large scale use of chemical pesticides because these are adversely affecting soil, surface and ground water as well as the biodiversity. These chemical pesticides may leach or percolate deep in soil or underground water. It may affect the friendly bacterial flora as well as soil micro and macro fauna adversely. The pH of soil is also badly affected which worsens the soil and plant friendly micorrhizal activities. Various pollinators and birds are killed by extensive use of non-biodegradable synthetic organo-pesticides such as DDT, Malathion, BHC, and Chlorpyriphos [3,4]. Herbal pesticides are the best choice for Bio-control of harmful agricultural insect-pest and their eco-friendly management, as they are economical, easily available and environment friendly. The only limitation of using herbal pesticides is their narrow spectrum of effectiveness against insect-pests.

II. MATERIALS AND METHODS

Place and time of Study

All the experiments were carried out at the department of zoology, MLK PG College, Balrampur, in the insect-proof chambers during July to September 2020 on potted Tomato plants. A total of 10 potted tomato plants pots were taken inside insect-proof chambers of which two potted plants were kept as control plants while rest were taken as experimental plants for different herbal pesticides use in two sets for each experiment. The soil of garden which was visibly infested with *Allopeas clavulinum* was taken as base soil in all pots.(Fig-1)

Fig-1 Showing *Allopeas clavulinum* in Potted plants Soil (10X image)

Screening of suitable plants for pesticide use-

In search of proper herbal or eco-friendly pesticide for the management of *Allopeas clavulinum* there were screened four herbal aqueous extracts namely Neem leaves, Clerodendron leaves, *Prosopis cineraria* and Pongamia pinnata leaves in standard 10 percent concentration. Neem, *Clerodendron* and *Pongamia pinnata* were selected as they are abundant and known to have some insecticidal properties [5] while *Prosopis cineraria* was taken as experimental plants material because it was observed that there is no visible infestation of *Allopeas clavulinum* in gardens where Shami plants are grown.

Preparation of Aqueous extracts of plants to be used as herbal pesticides-

100 grams fresh leaves were taken of each plant, thoroughly washed and sterilized with mild soap, again washed and soaked overnight in 500 ml distilled water. On next morning all samples were grinded in water separately, using the same water which was used for soaking overnight for each plant material. Filtered each extract with Whatman No.1 qualitative filter paper. After filtration distilled water was added in the measuring flask to make the final volume one litre. The entire process was done under laminar air flow machine to avoid any unwanted microbial contamination.

Primary soil treatment by using10 percent aqueous extracts of all possible plants–

50 ml spray of all four plant's 10 percent aqueous extracts were used on the upper soil layer of two potted tomato plants each and found that although Neem and *Prosopis cineraria* both showed effectiveness against the snails but Neem adversely impacted over tomato leaves by causing tiny spots first and after that the leaves stunted (Fig-2). Now the aqueous extract of *Prosopis cineraria* is the suitable plant material to be used as herbal pesticide against *Allopeas clavulinum* as shown in Table-1.

Table-1 showing results of screening for best suitable herbal pesticide for *Allopeas clavulinum*

Potted plant No./ Effect of Plant Biopesticide used	**Neem leaves**	**Clerodendron leaves**	***Pongamia Pinnata* Leaves**	***Prosopis cineraria* Leaves**
Potted tomato -1	Snail died but tomato leaves stunted	-	-	-
Potted tomato -2	Snail died but tomato leaves stunted	-	-	-
Potted tomato -3	-	No effect on snails	-	-
Potted tomato -4	-	No effect on snails	-	-
Potted tomato -5	-	-	No effect on snails	-
Potted tomato -6	-	-	No effect on snails	-
Potted tomato -7	-	-	-	Snails died and no effect on tomato plant
Potted tomato -8	-	-	-	Snails died and no effect on tomato plant
Potted tomato -9	Control plants	Control plants	Control plants	Control plants
Potted tomato-10	Control plants	Control plants	Control plants	Control plants

Fig-2 showing adverse effect of 10 percent Neem leaf Extract on Tomato Leaves

Standerdization of most suitable Biopesticide-

The *Prosopis cineraria* aqueous extract was found most suitable but it is now to be standardized for the most suitable concentration. The aqueous extracts of concentration 5%, 10%, 15% and 20% were tried on experimental plants, and the 15 % concentration extract was found to be most effective with no recurrence of *Allopeas clavulinum* even after 15 days of soil treatment spray with 50 ml of extract, while 5% and 10% extracts killed the snails but there was recurrence. The 20 % concentration extract was also found very effective but caused some adverse effects like blighted leaves over plants when sprayed. The snails have some dark colored appearance after their death after spray(Fig-3).

Fig-3 Showing Living and Dead *Allopeas clavulinum* after biopesticide soil spray

III. RESULTS

15 percent aqueous leaf extract of Shami plant (*Prosopis cineraria*) was found effective as an eco-friendly as well as economical management tool for the harmful soil inhabitant 'Spike awl snail' (*Allopeas clavulinum)*. The 20 % concentration extract was also found very effective but caused some adverse effects like blighted leaves over plants when sprayed, therefore it was avoided. It was also observed that the dead snails have some darker appearance after the spray of herbal pesticide.

IV. DISCUSSIONS

The harmful 'Spike awl snail' (*Allopeas clavulinum)* was tried to be effectively managed with aqueous extracts of four plants i.e. Neem, Clerodendron, Pongamia and Shami (*Prosopis cineraria*). Though the neem and Shami both were found effective against the snail, Neem extract's 10 percent concentration had adverse effect on tomato plant leaves. It may be possible that Neem is good over other plants but the tomato plants may have some sensitivity against neem leaves extract in that concentration.

The Shami plant's (*Prosopis cineraria*) 15 percent aqueous extract was standardized and used effectively against the snails. Besides the biopesticidal use, the remaining fibrous residue of leaves may also be used as green manure as the *Prosopis cineraria* is a leguminous plant and it contains good amounts of nitrogen, which will be added to its merits as biopesticide (Fig-4). For large scale application one percent mild soap should be added as emulsifying agent for even concentration spray for long time, however during present study no soap was added to eradicate any deviation in results due to the presence of soap. Further commercial application protocols and patents regarding the use of *Prosopis cineraria* leaf extract will be carried out in near future.

V. Conclusion

The harmful *Allopeas clavulinum (*spike awl snail) was successfully managed by the aqueous leaf extract of *Prosopis cineraria* plant in 15 percent concentration in an ecofriendly way.

Fig-4 Showing extraction of *Prosopis cineraria* leaf extract (Herbal Pesticide)

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AUTHORS PROFILE

Dr. Akanksha Tripathi is an ardent researcher and an experienced teacher. She has been teaching since 2006 in M.L.K.P.G. College, Balrampur, U.P. after completing her master degree from C.S.J.M. University, Kanpur. Besides this she also cleared UPSLET 2004 conducted by UGC. She also got her Ph.D. degree in 2014 from Avadh University, Faizabad. Currently she is working as an assistant professor in the same college. She has been published many research papers in reputed International and National journals and participated in various seminars. She is also a co-author of book "Current Trends in Biology". Presently She is the member of Board of Studies and research advisory committee in Siddharth University, Kapilvastu, Siddharth Nagar. She is also an active member of various committees in her college like anti sexual and harassment cell and admission committee. She is also the member of various scientific societies. She has been working as jury member of Indian children's science congress and district science club, Balarampur, UP.

